



Patterns of international mobility of researchers: evidence from the GlobSci survey

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THE GLOBAL SCIENCE PROJECT



- Study of the impacts of globalisation of scientific research on the performance of national scientific systems, with a focus on science policies (co-funded by Italian government and the NBER, 2009-2012).

A. Analysis of trends in the relative performance in top-tier research by different countries during the past 10 years and the related impact of national incentive policies.

Franzoni et al. (2011) *Science*

B. Collection of new comprehensive data on the international mobility of scientific researchers. Analysis of the determinants of migration and related impacts on both source and destination countries.

Franzoni et al. (2012) *WP NBER 18077*

MOTIVATIONS



- US data stress the relevance of the mobility phenomenon:
 - 41.6 percent of those with doctorates working in a science and engineering occupation in 2009 were born outside the United States.
 - Almost 60 percent of all postdocs working in the United States are on a temporary visa.
- However, still limited comparable evidence for European countries and for other countries (e.g. Brasil, India). The brain-drain debate in some countries has been based mostly on anecdotal evidence.
 - MORE project (2010) funded by the EU commission
 - OECD data (2010)
- Most of academic analyses investigate (using different tools: survey, census data, visa data, CV analysis, bibliometric data) only specific groups of scientists / disciplines or countries.
- The dynamics of international mobility of scientific researchers might differ from the ones investigated in the field of international economics for high-skilled migration.

OBJECTIVES OF THE PAPER



- Provide updated comparable statistics about the inflows and outflows of scientific researchers for a large sample of countries.
- Identify main mobility patterns between countries.
- Study whether mobility has an effect on the international openness of the scientific systems of the destination countries.
 - Measured by comparing the propensity to be involved in international collaborations of foreign born, returnees and native non mobile academic researchers.
 - Exploiting detailed individual data from the GlobSci survey.

THE GLOBSCI SURVEY (I)



- **4 Fields:** Biology, Chemistry, Earth and Environmental sciences, and Materials.
- **16 Countries:** Australia, Belgium, Brazil, Canada, Denmark, France, Germany, Italy, India, Japan, Netherlands, Spain, Sweden, Switzerland, UK, USA
- **7 option languages** (multiple branches web survey using Qualtrics ®)
- **Selection of panels:** based on corresponding authors of articles published in international journals in 2009 (selected by quartile of impact factor in WoS subfields)
- **Distribution period:** march – july 2011
- **Number of questionnaires collected:** 19,183
- **Aggregated response rate: 40.6%** (downward biased due to possible non-delivery)

THE GLOBSCI SURVEY (II)



- The questionnaire collects 4 layers of data:
 - A. Data about the respondent **background** (education, job condition, age etc.)
 - B. Data about the **mobility** (country at age 18, current country, international experience in the past, reasons for moving, reason for going back, likelihood to go back in the future)
 - C. Data on the **specific article** through which the respondent has been admitted in the sample (type of research, characteristics of the co-authors).
 - D. Data on the **research network** of the respondent (e.g. number of collaborating countries, propensity to collaborate).

THE GLOBSCI SURVEY (III)



■ Main advantages:

- A. Possibility to track also foreign born researchers that went back to the origin country (if included in 16 core countries).
- B. Data on the “entry point” of foreign born (e.g. PhD, post doc, faculty)
- C. Numerous individual level controls

■ Limitations:

- A. Problems encountered in fielding the survey in China.
- B. The questionnaire provides a snapshot in 2011.
- C. Statistics reflect outbound mobility towards the 16 countries

THE GLOBSCI SURVEY (IV)



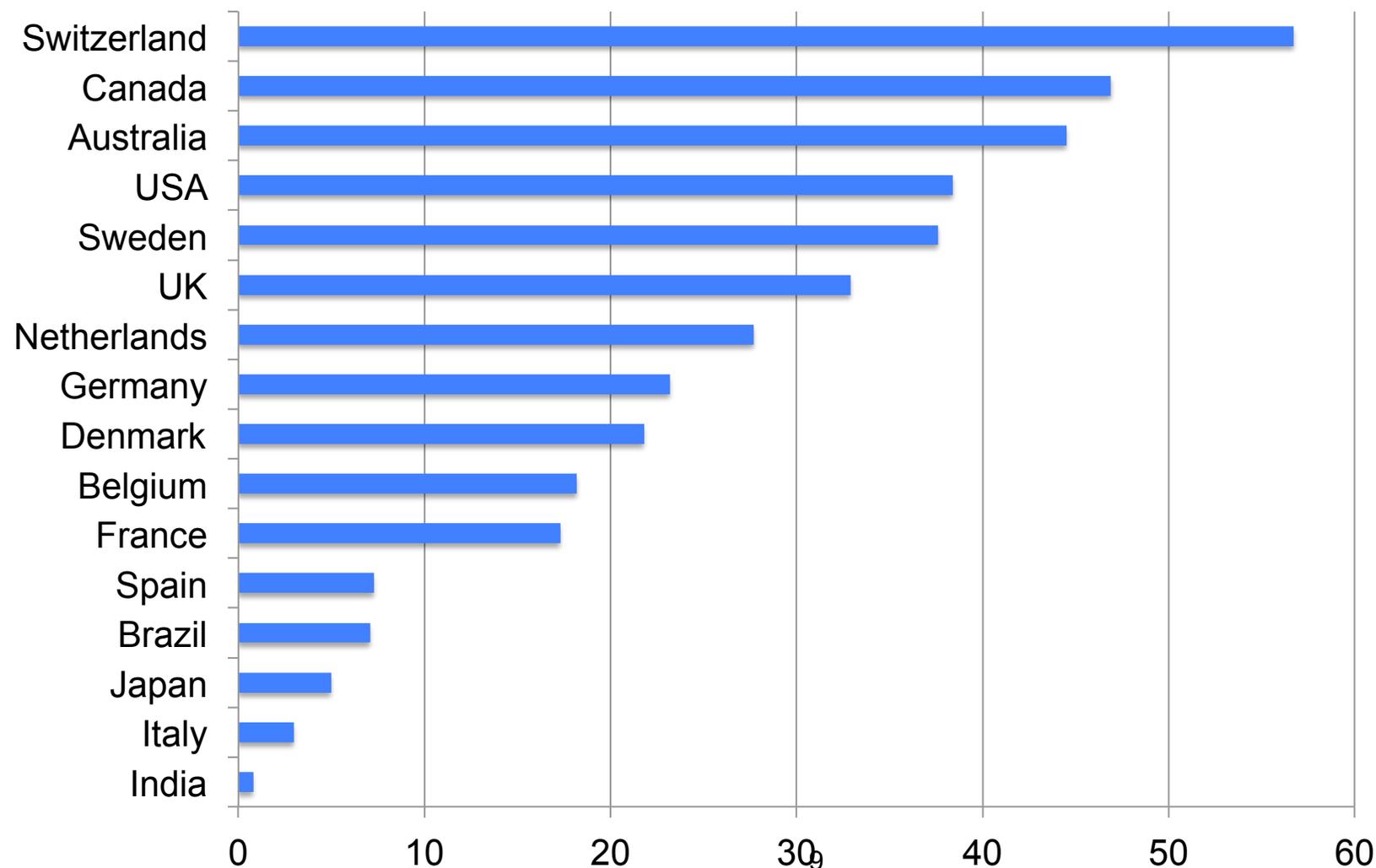
■ Sample size and response rates by country of residence in 2011.

Country	Answers	Resp. Rate	Country	Answers	Resp. Rate
Australia	676	43.00%	Japan	1,860	35.40%
Belgium	302	42.80%	Netherlands	391	37.70%
Brazil	762	49.60%	Spain	1,228	53.30%
Canada	1,020	41.50%	Sweden	353	40.00%
Denmark	227	44.20%	Switzerland	356	38.70%
France	1,618	42.10%	UK	1,355	36.70%
Germany	1,326	30.30%	U.S.	5,165	36.70%
Italy	1,917	69.00%	Total	19,183	40.60%

SELECTED EVIDENCE ON MOBILITY (I)



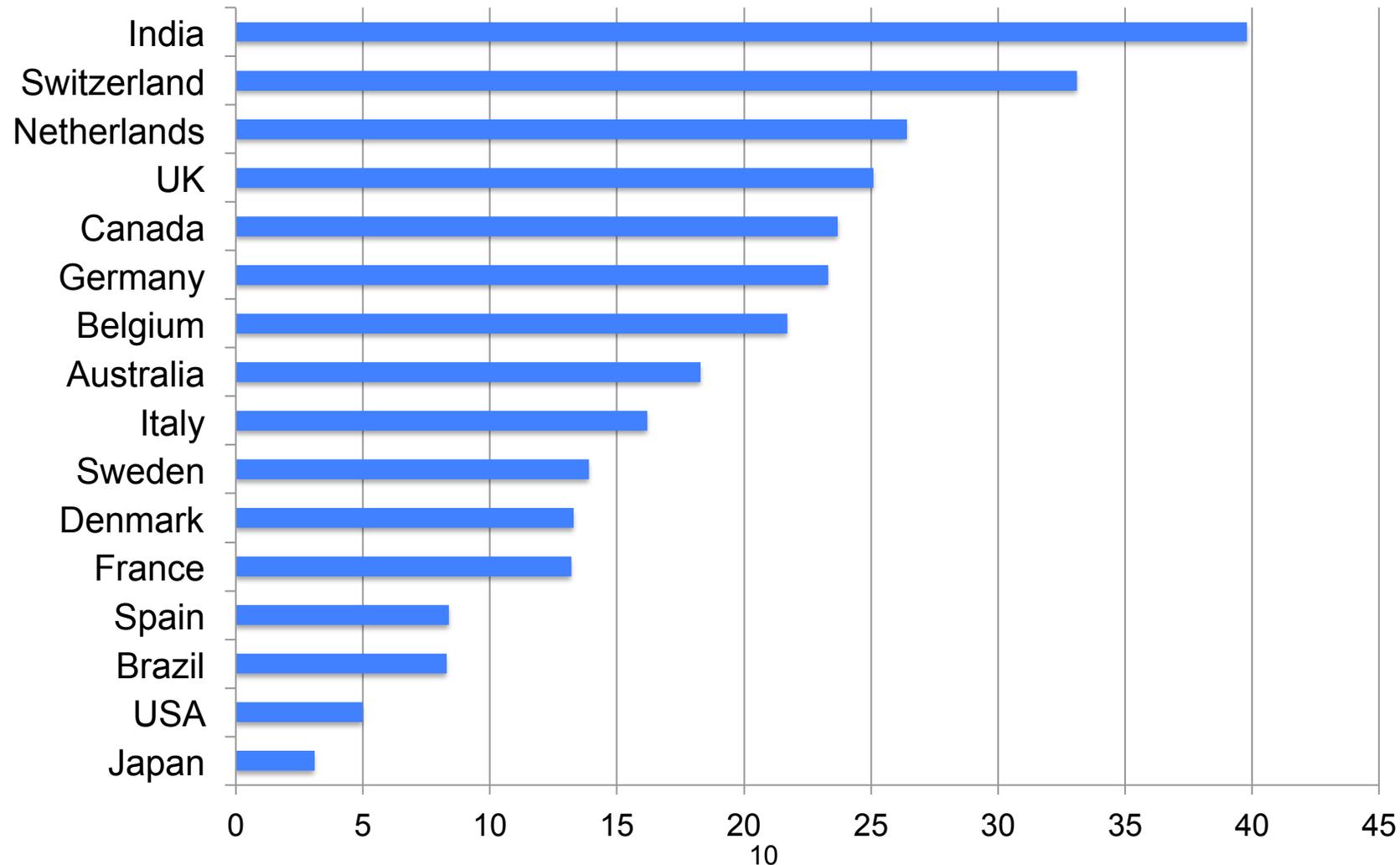
■ Incidence of foreign born researchers by country of residence in 2011



SELECTED EVIDENCE ON MOBILITY (II)



■ Incidence of researchers abroad in 2011 by country of origin



SELECTED EVIDENCE ON MOBILITY (II)



■ Countries supplying 10% or more of foreign workforce

Destination country	Supplying countries (%)
Australia	UK (21.1) China (12.5)
Belgium	Germany (15.2) France (15.2) Italy (13.0)
Brazil	Argentina (16.0) France (14.0) Colombia (12.0) Peru (12.0)
Canada	UK (13.5) U.S (13.5) China (10.9)
Denmark	Germany (24.4)
France	Italy (13.8)
Germany	None
Italy	France (13.0) Germany (11.1) Spain (11.1)
Japan	China (33.7) South Korea (11.6)
Netherlands	Germany (14.6) Italy (12.5)
Spain	Argentina (12.6) France (10.3) Italy (10.3)
Sweden	Germany (11.9) Russian Fed. (10.2)
Switzerland	Germany (36.9)
UK	Germany (15.2) Italy (10.4)
U.S.	China (16.9) India (12.3)

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



- Each respondent has been classified based on his mobility status as:
 1. Foreign-born: 24.3% of the full sample
 2. Returnee (after a PhD or post-doc or employment abroad): 29.7%
 3. Non-mobile: 46.0%

- For the sake of homogeneity we focus only on academic researchers.

- International network is measured through 2 approaches:
 1. Whether the selected article is internationally co-authored.
 2. The number of countries in which were located the co-authors of the respondent in the last 2 years (from the survey).

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



■ Dependent variables:

- International paper
- Large network (number of collaborating countries >4)

■ Independent variables:

- Mobility status
- Age, gender, institution type, current country dummies, field dummies
- Self-assessed relevance of the paper in the scientific production of the author
- Team size

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



■ Econometric models:

- Probit models on the measures of international openness of research networks
- OLS models on the quality of international co-authored papers proxied by the impact factor.
- The international collaboration propensity of foreign born and returnees are tested against a baseline represented, in each country, by native non mobile researchers

■ Robustness checks:

1. Models run for subsets of destination countries (USA, EU, Other)
2. Control for the country in which foreign born received their PhD.

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



- Incidence of internationally co-authored papers by scientific field and mobility status of respondent.

	All fields	Biology	Chemistry	Earth	Material
Full sample	23.94%	25.30%	23.61%	33.17%	22.82%
Foreign born	33.59%	30.52%	31.66%	42.68%	30.01%
Returnees	29.12%	28.85%	26.38%	43.23%	24.18%
Non mobile	20.26%	20.41%	17.88%	24.74%	18.15%

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



- Incidence of number of countries with which the scientist reported having one or more collaborations in past two years.

	Foreign born	Returnees	Non Mobile
No international collaborations	14.06	14.26	24.36
1 country	17.59	17.28	19.91
2 countries	20.98	20.17	18.92
3 countries	15.89	16.45	13.73
4 countries	10.66	10.40	7.37
5 countries	6.90	7.68	5.12
6 to 10 countries	11.23	11.09	8.38
11 or more other countries	2.69	2.68	2.22

THE LINK BETWEEN MOBILITY AND INTERNATIONAL RESEARCH NETWORK



■ The perceived impact of international mobility (1-5 scale)

	Returnees	Foreign born
Enlarging my research network	4.19	4.35
Establishing a stable research cooperation with teams/scholars located abroad	3.71	4.02
Entering into new fields of research	3.9	4.08
Learning new techniques/ theories	4.12	4.17
Improving my capability to publish in high-tiers journals	3.68	3.93
Improving my wage and earning possibilities	2.72	3.41
Improving my career prospects	3.89	4.08
Establishing better contacts with industrial partners	2.15	2.67
Improving my ability to raise research funds	3.16	3.65

SELECTED ECONOMETRIC RESULTS (I)

■ Probit marg effects. Dep variable: international co-authored paper.



	I	II	III
FOREIG BORN	0.109*** (0.010)		0.138*** (0.0112)
RETURNED		0.034*** (0.008)	0.074*** (0.009)
SIZE	0.058*** (0.002)	0.059*** (0.002)	0.058*** (0.002)
SIZESQ	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
CORE_PROJ	0.018*** (0.004)	0.018*** (0.004)	0.017*** (0.004)
AGE	0.001*** (0.000)	0.000 (0.000)	0.000** (0.000)
INDEPENDENT	0.011 (0.009)	0.001 (0.009)	0.004 (0.009)
FEMALE	-0.030*** (0.008)	-0.030*** (0.008)	-0.027*** (0.008)
Institution dummy	Y	Y	Y
Country dummies	Y	Y	Y
Field dummies	Y	Y	Y
Pseudo Rsq	0.1051	0.0986	0.109

SELECTED ECONOMETRIC RESULTS (II)

■ Probit marginal effects. Dep variable: large international network.



	I	II	III
FOREIGN BORN	0.063*** (0.009)		0.084*** (0.010)
RETURNED		0.0291*** (0.008)	0.054*** (0.009)
AGE	0.002*** (0.000)	0.002*** (0.000)	0.007*** (0.000)
INDEPENDENT	0.096*** (0.009)	0.090*** (0.009)	0.091*** (0.009)
FEMALE	-0.0651*** (0.008)	-0.0641*** (0.008)	-0.062*** (0.008)
Institution dummy	Y	Y	Y
Country dummies	Y	Y	Y
Field dummies	Y	Y	Y
Pseudo Rsq	0.106	0.104	0.108

SELECTED ECONOMETRIC RESULTS (III)



■ OLS model. Dep var: impact factor (only intern. co-authored papers)

	I	II	III
FOREIG BORN	0.280** (0.130)		0.563*** (0.142)
RETURNED		0.414*** (0.120)	0.632*** (0.132)
SIZE	0.335*** (0.034)	0.335*** (0.033)	0.337*** (0.033)
SIZESQ	-0.005*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)
CORE_PROJ	0.408*** (0.062)	0.414*** (0.062)	0.402*** (0.062)
AGE	0.107*** (0.040)	0.101** (0.040)	0.096** (0.040)
AGESQ	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
INDEPENDENT	0.683*** (0.146)	0.622*** (0.146)	0.630*** (0.146)
FEMALE	-0.345*** (0.130)	-0.328** (0.130)	-0.319** (0.130)
Constant	-2.829** (1.132)	-2.819** (1.131)	-2.905** (1.129)
Observations	3,670	3,670	3,670
Adj. R-sq	0.184	0.186	0.189

SELECTED ECONOMETRIC RESULTS (IV)



■ Testing the moderating effect of PhD in the destination country.

	large network	international paper	impact factor
FOREIG BORN	0.086*** (0.012)	0.120*** (0.012)	0.413*** (0.151)
Entered as PhD	-0.049*** (0.014)	-0.024* (0.014)	-0.359* (0.207)
SIZE		0.058*** (0.002)	0.334*** (0.034)
SIZESQ		-0.001*** (0.000)	-0.005*** (0.001)
CORE_PROJ		0.018*** (0.004)	0.410*** (0.062)
AGE	0.002*** (0.000)	0.001*** (0.000)	0.106*** (0.040)
AGESQ			-0.001*** (0.000)
INDEPENDENT	0.095*** (0.009)	0.011 (0.009)	0.676*** (0.146)
FEMALE	-0.065*** (0.008)	-0.031*** (0.008)	-0.347*** (0.130)
Adj. R-squared			0.185
Pseudo R-sq	0.107	0.105	

LINKS WITH THE ORIGIN COUNTRY? (I)



- Incidence of foreign born researchers that report collaboration with other researchers based in their country of origin.

Current country	(%)
Australia	46.1
Belgium	55.6
Brazil	29.3
Canada	35.8
Denmark	33.3
France	57.7
Germany	39.0

LINKS WITH THE ORIGIN COUNTRY? (II)



- Incidence of foreign born researchers that report collaboration with other researchers based in their country of origin.

Current country	(%)
Italy	56.8
Japan	43.5
Netherlands	53.4
Spain	38.0
Sweden	56.7
Switzerland	50.3
UK	44.0
USA	37.4
TOT	41.7

EXPAT COMMUNITY EFFECT? (I)



- Incidence of scientific collaboration within the same lab / department between foreign born researchers and other researchers from the same origin country that have emigrated.

Current country	Incidence
Australia	34.05%
Belgium	40.00%
Brazil	31.71%
Canada	25.83%
Denmark	43.33%
France	32.34%
Germany	32.86%

EXPAT COMMUNITY EFFECT? (II)



- Incidence of scientific collaboration within the same lab / department between foreign born researchers and other researchers from the same origin country that have emigrated.

Current country	Incidence
Italy	27.27%
Japan	37.10%
Netherlands	26.03%
Spain	45.07%
Sweden	24.44%
Switzerland	44.17%
UK	26.24%
USA	23.91%
TOT	28.25%

RESULTS (I)



- More than 40% of the researchers sampled in the four fields in Switzerland, Canada and Australia are immigrants.
- Different patterns across European countries, with a considerable share of foreign born researchers also in Netherlands, Germany and Sweden.
- On average about 40% of foreign-born scientists in our sample reports having kept research links with their country of origin.
- All else equal, being foreign born increases the likelihood of having an international collaboration by 13.8 percentage and being a native with experience of work or study abroad increases the likelihood by 7.4 percentage points.
- On average international co-authored papers with a mobile corresponding author show a higher impact factor.

RESULTS (II)



- “foreigner premium” on collaboration propensity and research quality is driven mostly by mobile researchers who have training or work experience outside of the destination country where they were surveyed in 2011.
- Returnees and foreign born researchers tend to assign the highest reason related to mobility to issues such as “enlarging my research network” and “learning new techniques / theories” → high-skilled migration patterns – at least in the specific case of scientific careers - cannot be fully captured by underlying theoretical models that predict mobility primarily on the basis of wage differentials.

LIMITATIONS AND WORK AHEAD



- Given the structure of the data we can assess correlations and not strict causality.
- Qualify the structure of international collaborations (based on the sampled paper).
- Qualify the mobility status (e.g. mobility supported by a fellowship).